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# The DASHEEN

A Southern Root Crop  
For Home Use *and* Market



FARMERS'  
BULLETIN  
Nº 1396

U. S. DEPARTMENT OF AGRICULTURE

ONLY TWO distinctly starchy vegetables, the potato and the sweetpotato, are commonly grown in the United States. A fall-maturing crop of the same character—the dasheen—was introduced a number of years ago for cultivation in the Southern States, primarily to supplement the small supply of home-grown potatoes. Most of the potatoes used in the far South are shipped from the North, and a part of this need might well be met by dasheens locally grown.

The foreign populations of our large cities use considerable quantities of dasheens and related vegetables, all imported from the West Indies and the Orient. This market is now supplied in small part by dasheens grown in the lower South.

Dasheens are used generally for home consumption by hundreds of growers and to a small extent by native Americans in a number of cities. Conservatism in food habits and the frequent marketing of dasheens of unattractive appearance or inferior quality have prevented a more rapid growth of the market demand. Continuous effort by growers and others in the South to make the excellence of this vegetable known to winter tourists and care in marketing only the best dasheens are calculated to bring about an increased demand.

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# THE DASHEEN; A SOUTHERN ROOT CROP FOR HOME USE AND MARKET<sup>1</sup>

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## WHAT THE DASHEEN IS

DASHEENS have been grown commercially in the Southern States since 1913. They were cultivated experimentally or for home use by a few persons several years earlier. The Trinidad dasheen—the variety commonly grown in the South—is an especially rich-flavored, mealy cooking, and prolific variety of the Polynesian and oriental taro (*Colocasia esculenta* (L.) Schott). In food properties it is very similar to the potato, but the dasheen contains less water, and in consequence the content of starch and protein is about one-half greater than that of the potato. The name "dasheen" is believed to be a corruption of the French expression "de Chine" (from China),<sup>2</sup> indicating the supposed country of origin of this variety of taro. The full name originally used in the West Indies was probably "taro de Chine" (Chinese taro) or something of similar meaning, but the first part of the name seems to have passed out of use in most, if not all, localities.

<sup>1</sup> Previous publications of the United States Department of Agriculture (now out of print) on dasheen culture are as follows:

Bureau of Plant Industry Bulletin 164, *Yautias, Taros, and Dasheens*.

Bureau of Plant Industry Circular 127, *The Dasheen, a Root Crop for the Southern States*.

Bureau of Plant Industry [Document] 1110, *The Dasheen, a Root Crop for the South*. Yearbook 1916, pp. 199-208, *The Dasheen: Its Uses and Culture*.

Department Circular 125, *Forcing and Blanching Dasheen Shoots*.

Department Bulletin 1247, *Taros and Yautias; Promising New Food Plants for the South*.

<sup>2</sup> O. W. Barrett, who was formerly connected with the Division of Plant Exploration and Introduction and who spent some time in Trinidad as well as in other parts of the West Indies, states that the word "dasheen" originated in Trinidad, being an anglicized form of "da Chine" (pronounced dah-sheen)—the expression used in the French patois of the West Indies spoken by the peasant class of Trinidad. This opinion is confirmed in its essentials by other investigators.

Taros, or dasheens, of varieties similar to or identical with the Trinidad dasheen are also known in various parts of tropical America under the names "malanga", "eddo", "coco", "taya", "tanier", and "tannia" (also spelled tanyah and tanya). These names are likewise applied to other types of taros<sup>3</sup> and to some of the yautias (*Xanthosoma caracu* Koch and Bouché and other species).

The word "taro" (also called kalo in Hawaii) is Polynesian and is so widely known and used that it is better to use this as the common name for the species of *Colocasia* rather than any of the various other names that have come into use in North America. Most of these local names have become so firmly fixed for the old familiar varieties, however, that they will probably be displaced only as newer and better varieties under other names are introduced.

#### GENERAL DESCRIPTION OF THE DASHEEN

The dasheen is a broad-leaved member of the arum family (fig. 1), to which belong also the calla and the jack-in-the-pulpit (Indian turnip). It resembles in general appearance its close relative, the



FIGURE 1.—A field of the Trinidad dasheen in central Florida, as it appeared in August. The plants are spaced 4 by 3 feet (they can be planted closer) and vary from 5 to 7 feet in height. The soil is known as hammock, a rather rich sandy loam underlain with stiff clay. Planting is done about March 1, and the crop is ready to harvest in November. This field yielded 350 bushels of dasheens per acre. Two applications of a complete commercial fertilizer at the rate of 700 pounds per acre were given.

ordinary elephant-ear (*Colocasia antiquorum* Schott, often called *Caladium esculentum*). The Trinidad dasheen differs from most other taros in having its corms and cormels (primary and second-

<sup>3</sup> From early colonial times there have been grown in gardens and in other suitably moist spots at various places in our Southeastern States two distinct varieties of taro under the name tanyah (or tanya). One of these taros, often called the "blue" tanyah because the flesh becomes somewhat bluish or violet when cooked, has pink buds and roots; it is a variety of *Colocasia antiquorum* Schott and practically identical with the ordinary elephant-ear. The other variety becomes yellowish when cooked and is called the "yellow" tanyah when it is desired to distinguish between the two. The plants of the latter variety are smaller than those of the first, and the buds and roots are white. Both of these tanyahs, or taros, are acrid in the raw state, but the yellow variety is much the more acrid and requires boiling for at least 2 hours to render it edible.

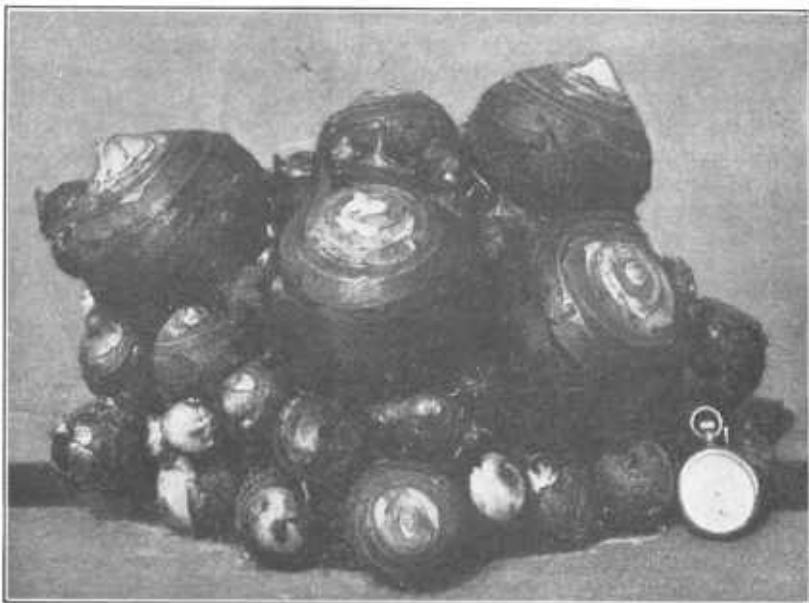


FIGURE 2.—A 23-pound hill of the Trinidad dasheen before being broken up, showing the relative position of the corms and tubers (cormels) as they grew. This hill, which is much above the average size, contains five corms instead of the usual one or two. They weighed 12 pounds. There were about 4 pounds of marketable tubers and secondary corms, which with the five corms made 16 pounds of marketable dasheens from this hill.



FIGURE 3.—A 2½-pound Trinidad dasheen corm and some first-grade tubers suitable for table use or market, weighing 4 to 6 ounces each. (Much reduced.) The two large light spots near the base of the corm are scars where tubers were attached. Dasheen corms and tubers contain 50 percent more protein and starch than the potato and have a delicate nutty flavor when baked or boiled.

ary "tubers") practically free from the aeridity so common to aroids in general, which is exemplified in the Indian turnip. However, caution should be used in tasting unecooked dasheens, for there is always the possibility that some aerid taro of similar appearance has become mixed with the nonaerid variety. The leaves of the dasheen are very aerid and should not be tasted except when cooked as greens according to the special directions given on page 34. In cases of the accidental eating or chewing of the leaves or of aerid corms or tubers, the resulting irritation of the mouth and throat is usually relieved by the use of lemon juice in a little water.

There are many varieties, more or less distinct, of taros having the same general habits of growth as the Trinidad dasheen. In view

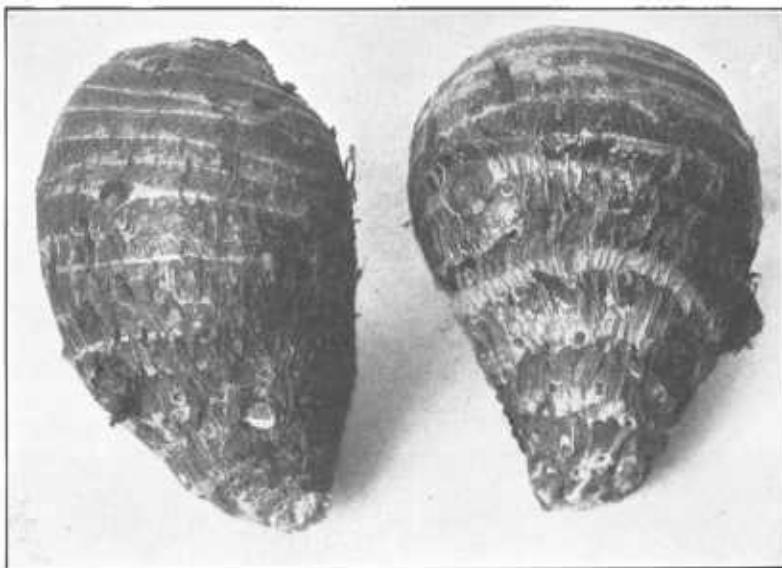


FIGURE 4.—Secondary dasheen corms (reduced). A secondary corm results when a cormel, or lateral tuber, sends up leaves and gives rise to other tubers. It usually enlarges greatly toward the apex (bud end) and sometimes increases to more than half the size of the parent corm. Secondary corms are commonly somewhat flattened on one side (next to the parent corm), as shown by the side view of the 11-ounce specimen on the left. Secondary corms vary greatly in size and form, but in quality they always resemble the primary corm more than a tuber.

of the origin of the word "dasheen," however, it would be more appropriate to call these varieties "taros" except where there is reason to believe that they are of Chinese origin.

In the dasheen type of taro the tuberous growth (figs. 2 and 3) consists of one or more (according to the number of original sprouts from the material planted) large edible central corms and a considerable number of edible cormels, or lateral tubers, compactly clustered. Both corms and tubers are usually more or less ovoid, but the form varies somewhat with the variety and with the length of the season. Leaves are produced in a whorl by each corm and usually by each of several tubers in a hill. The leaf (fig. 1) is peltate (the petiole, or leafstalk, attached near the center of the blade), erect, and 3 to 7 feet high under suitable conditions; blade ovate to broadly ovate, rather dark velvety green above, and in some

varieties with a purplish spot at the point of petiole attachment; the petiole varies in color, according to the variety, from plain green to light or dark purplish maroon in part or throughout its length.

Dasheen corms vary in weight, with the size and vigor of the plants, from less than a pound to more than 8 pounds each. The tubers vary from less than an ounce to a pound or more each. One



FIGURE 5.—Front view (natural size) of the flattened secondary dasheen corm shown on the left in figure 4.

or more of these lateral tubers in each hill often attain the size of a small corm and also assume something of its shape and other characteristics. Such tubers are called secondary corms (figs. 4 and 5). In quality the secondary corms closely resemble the primary corms from which they spring. The color of cooked dasheens just beneath the skin is purplish; and the flesh of the corms and of any tubers which may have sent up leaves is frequently more or less tinged with violet, though occasionally it is entirely free from

this coloration. The violet-colored dasheens are often of richer flavor than those of creamy or other light shades.

#### CHEMICAL COMPOSITION AND DIGESTIBILITY

The composition of dasheens varies slightly with the variety and with circumstances, such as the soil in which they are grown, the length of time in storage, and the temperature and moisture content of the air where stored. Differences in composition due to the latter causes are, of course, mainly in moisture content. The most rapid loss of moisture naturally occurs within the first week or two after the dasheens are dug, the rate of loss depending on the freedom of ventilation and the moisture and temperature conditions of the air. An average of 10 analyses of the edible portions of corms and tubers of the Trinidad dasheen, made in February and March (of different years) by the Bureau of Chemistry and Soils, of the United States Department of Agriculture, gives percentages as follows:

|                     |       |
|---------------------|-------|
| Water               | 62.77 |
| Protein             | 3.03  |
| Carbohydrates:      |       |
| Starch              | 26.09 |
| Soluble sugar       | 1.75  |
| Pentosans           | 1.24  |
|                     | 29.08 |
| Ether extract (fat) | .16   |
| Crude fiber         | .71   |
| Ash                 | 1.30  |
| Undetermined        | 2.95  |
| Total               | 100   |

The average analysis of the potato gives the protein content as 2.2 percent and the starch about 18 percent, the sugar and fat contents being negligible. The sugar content of the dasheen is 1 3/4 percent, which accounts for the noticeably sweeter taste of this vegetable in comparison with the potato. In the sweetpotato the average starch content is 21.1 percent, sugar 5 percent, protein 1.8 percent, and fat 0.7 percent. Although the total carbohydrate content of the dasheen is but little above that of the sweetpotato, the protein content is more than one-half greater.

The starch grains of the dasheen are among the smallest<sup>4</sup> in food plants. Whether for this or some other reason, dasheens and other taros are reputed in countries where commonly grown to be more easily digested than other starchy foods. Although there are no published reports of scientific tests to determine just what foundation underlies this popular belief, experience to similar effect is reported by many persons in this country. The question of the completeness of digestibility of dasheens has been investigated, however, by specialists of the Department, and the conclusions (reproduced from Department Bulletin 612, now out of print) of the investigators are here given:

In 10 digestion experiments with men, mature and immature dasheens were eaten in conjunction with common food materials in a simple mixed diet. The

<sup>4</sup> This statement is based on measurements of starch grains of different plants made by B. J. Howard, formerly of the Bureau of Chemistry, now of the Food and Drug Administration, U. S. Department of Agriculture. Photomicrographs taken by him, showing comparative sizes of the grains of four different kinds of starch, including that of taro, appear in Bureau of Plant Industry Bulletin 164, now out of print.

average coefficients of digestibility for the total diet were: Protein, 80.8 percent; fat, 96.1 percent; and carbohydrates, 97.6 percent.

The value obtained for the digestibility of the carbohydrates, 97.6 percent, which for all practical purposes represents the digestibility of the dasheen carbohydrates, compares very favorably with that of potatoes, the common vegetable most resembling the dasheen.

The subjects of their own volition ate on an average approximately 1½ pounds of dasheen daily without any observed physiological disturbances, which would indicate that considerable amounts of dasheens may be safely used in the dietary and that they are palatable.

The results here reported were obtained from dasheens cooked by one method only; in the absence of data to the contrary it may be very well assumed that the dasheen is equally well digested when prepared by other methods similar to those employed with potatoes.

The data obtained in this investigation give evidence to justify the belief that the dasheen is a valuable addition to the dietary, that it can replace the potato in those regions where the potato cannot be successfully grown or easily obtained, and that it is also valuable for more general use to give greater variety to the diet in other localities.

From this summary of the investigation it is evident that in completeness of digestibility the dasheen does not differ materially from the potato.

#### HISTORY OF THE INTRODUCTION OF THE DASHEEN

The first definitely recorded introduction of the Trinidad dasheen to the mainland of the United States for cultural experiments was from Puerto Rico, in 1905. The variety had been previously obtained by the Agricultural Experiment Station, Mayaguez, Puerto Rico, from the island of Trinidad. It is believed to have been brought from China to the Western Hemisphere perhaps 2 or 3 centuries ago, and it has been cultivated under various names in many of the West Indies. Varieties identical with it in appearance and resembling it in quality have been obtained from Dutch Guiana and Peru.

#### BEGINNING OF THE DASHEEN INDUSTRY IN THE UNITED STATES

The first field tests which showed conclusively that dasheens could be grown successfully in the Southern States were made in 1908 and 1909 in central Florida and near Charleston, S. C. Dasheens have been grown by a gradually increasing number of people in the far South since 1913. In the spring of that year the sending out of seed tubers on a rather broad scale to experimenters was begun by the United States Department of Agriculture.

There was a small but growing demand for dasheens for several years following the spring of 1914. Very early in that year the Bureau of Plant Industry received a specimen taro obtained at New York from a commercial shipment from Beirut, Syria. It was learned that this taro was being imported for food purposes. As the dasheen was somewhat similar to it and considered to be of superior quality, the question of substituting American-grown dasheens was taken up with the importers. After testing a small sample, these importers expressed entire willingness to purchase the new vegetable and to co-operate in helping to build up a dasheen industry in the Southern States. The season being far advanced, it was possible to obtain only

a few hundred pounds of dasheens at that time, but this was the beginning of a regular market demand, which in the season of 1920-21 had increased to an aggregate of about 10 carloads. In the meantime the industry had become largely centered in the vicinity of the towns of Callahan and Hilliard, Nassau County, in northeastern Florida, not far from Jacksonville. A smaller dasheen center had also developed in Effingham County, Ga., about 30 miles north of Savannah. The annual shipments of dasheens from these and other localities continued to approximate 10 carloads for a number of years subsequent to 1921.

In 1923 most of the dasheen growers in Nassau County, Fla., united to organize and incorporate the Nassau County Dasheen Growers' Association, which name later was changed to the Nassau County Dasheen Growers, Inc. The purpose of organization was to effect better grading of the dasheens marketed, thereby entitling the producers to better prices and to secure the latter by orderly marketing. This brief outline of the development of the industry would be incomplete without mention of three of the farmers most active in forming the co-operative. These were Rudolf W. Froitzheim, who introduced and first demonstrated the successful growing and marketing of dasheens in that locality, J. G. Page, and Ernest Petree, who later became manager of the association. The efforts of these men, supported by those of other active members, in behalf of the association made it possible for this cooperative to continue to function more or less effectively for a number of years for the well-being of the local industry. Mr. Petree, who served as a collaborator of the Department for several years, grew the large official collection of varieties of dasheens and other taros, and made observations on them. A mechanical dasheen grader for local use was devised by him and a brother, and they also carried on other experimental work looking toward the building of a larger and more permanent industry in the growing and utilization of dasheens. However, in the course of time shipments of dasheens fell off considerably, largely because of destructive competition from abroad.

Between the years 1912 and 1923 the Department of Agriculture devoted a good deal of attention to the growing of dasheens and the placing of experimental quantities with institutions and individuals in a campaign to popularize the use of the vegetable. It was hoped that with the impetus given by these activities commercial producers might be able to carry forward the introduction with increasing success. This hope has not yet been realized.

#### POSSIBILITIES FOR GROWTH OF THE INDUSTRY

The extent to which the present northern markets for dasheens can be developed is uncertain. As in earlier years, the principal consumers of dasheens in our northern cities still are the people of oriental and tropical origin and, in general, of low income. Between about 1919 and 1930 a large import trade in dasheens and other taros developed with other producing countries. Total imports are available for the fiscal years 1930 to 1935, inclusive, and these in round numbers are as follows:<sup>5</sup>

<sup>5</sup> These figures are from data furnished by the Bureau of Entomology and Plant Quarantine, U. S. Department of Agriculture.

|           | <i>Pounds</i> |
|-----------|---------------|
| 1930----- | 2,854,000     |
| 1931----- | 2,521,000     |
| 1932----- | 2,305,000     |
| 1933----- | 2,091,000     |
| 1934----- | 2,560,000     |
| 1935----- | 2,152,000     |

These quantities are estimated to be at least 10 times those marketed by producers in the Southern States during the same years. It does not follow, however, that quantities approximating the imports could have been sold by our growers, at paying prices, even if there had been no dasheens imported. Higher prices necessarily would mean purchases in smaller quantities. The cost at the ports of entry of the imported product, including duty of 50 percent, appears to have ranged roughly from 2 to 3 cents a pound, usually somewhat nearer the lower figure.

A considerable number of people of occidental and northern origin became accustomed to the more or less frequent use of the vegetable during the period 1913 to about 1924, and it is reasonable to believe that they and many others would come to use dasheens with increased frequency, provided the market were kept supplied with the product regularly and in attractive form. The failure thus far to meet this need is due, at least in part, to the small size of the industry and the consequent lack of resources necessary for carrying on aggressive work in building a market among the people more generally. Considerable ground in this field has been lost in recent years. Were the crop adapted climatically for commercial culture in some part of the Pacific coast region, as well as in the Gulf region, the difficulties in the way of introduction of the dasheen into wider use would be materially lessened.

To lengthen the season during which dasheens are available, by storing the surplus part of the crop under suitable storage conditions as soon as harvested and properly cured, would unquestionably lead to materially increased consumption of dasheens each year. In the South, where much of the time the temperature is too high for ordinary storage, a part of the commercial crop has usually been left in the hands of the growers until sprouting or partial decay has taken place, and a satisfactory supply has not been available for the usual late winter and early spring demand. Dasheens can be handled and stored (p. 18) so that they will keep well without sprouting (fig. 6), at least until late spring. If the dasheen industry is to grow as it deserves, the vegetable must not only be put on the market as early as possible but must be kept there in first-class condition continuously during the season and the season prolonged by proper storage methods to its greatest length. When the growers can show that further development of the industry is dependent upon new knowledge of storage possibilities, they will be warranted in asking that a scientific study of the whole problem of storage be undertaken by competent investigators.

The making of some manufactured product, such as dasheen chips or crisps (figs. 24 and 25), on a commercial scale would unquestionably be a great stimulus to the industry. A business of this kind, if undertaken, should be started in proximity to one of the dasheen-growing sections in order to avoid heavy transportation expense on the raw product and to enable the manufacturers to obtain



FIGURE 6.—Dasheen tubers photographed the latter part of May, unsprouted after having been in storage nearly 6 months in an ordinary basement at temperatures ranging between 40° and 55° F.

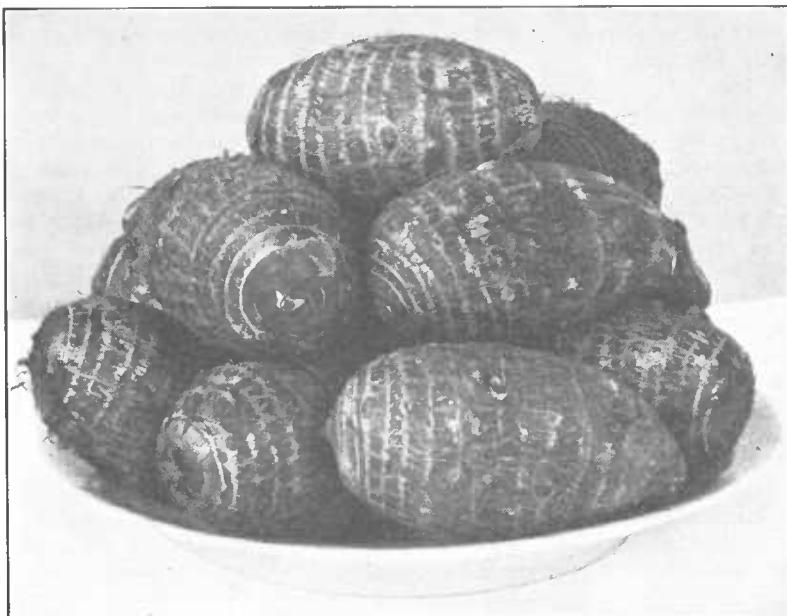


FIGURE 7.—Dasheen tubers (reduced), strictly No. 1 grade in shape and size (4 to 7 ounces each), ideal for nearly all culinary purposes. Usually less than one-fifth of the crop consists of such uniform tubers.

dasheens of suitable grades and quality. The excellence of the chips and crisps when properly made from good dasheens gives reason to believe that it is only a question of time until their commercial manufacture will become established.

#### VARIETIES

Of the many taros of the dasheen type that have been tested by the Department of Agriculture, two besides the Trinidad dasheen have proved of sufficient merit to warrant recommending them for further trial by growers who are already cultivating the Trinidad variety. In Department Bulletin 1247, Taros and Yautias (now out of print), information was given concerning other promising taros which should be of interest to southern dasheen growers. Descriptions of the three dasheen varieties follow:

*Trinidad* (*P. I. no. 15395*).—From the island of Trinidad, British West Indies. Leaves erect, 5 to 7 feet high; blade broadly ovate, rather dark velvety green above, with a purplish spot at the point of petiole (leafstalk) attachment, light green beneath; petiole dark green, shaded with numerous bronze or maroon lines—especially on the lower half—and with solid reddish maroon on the shoulder (next to the blade). Corms (figs. 2 and 3) roughly ovoid to nearly spherical; tubers (fig. 7) ovoid to long or irregular; buds reddish or pink; flesh white. Each hill produces from 1 to 5 corms and from 20 to 100 tubers. From 5 to 10 of the tubers give rise to a whorl of leaves, as does also each corm. When the corms are properly grown and cooked the flesh is mealy, rather dry, chestnut flavored, and is cream colored, grayish, or violet. When the tubers are cooked they are slightly moister, lighter in shade, and finer grained than the corms, though often less rich in flavor. This variety is very prolific, ordinarily yielding 250 to 350 bushels per acre in good soil. The yield per hill commonly varies from 4 to 10 pounds of cleaned corms and tubers. In unusually rich and deep sandy loams yields of 20 to 30 pounds from single hills have been recorded.



FIGURE 8.—A typical tuber (natural size) of the Sacramento dasheen, weighing 6½ ounces. This variety produces fewer lateral tubers to the hill than the Trinidad, but the average size is considerably larger, and the tubers are more nearly uniform in size and shape. Tubers of the Sacramento dasheen contain more moisture than those of the Trinidad and are usually not quite so rich in flavor, but they are whiter when cooked.

*Sacramento* (P. I. no. 47002).—Obtained in 1913 from a Chinese merchant in Sacramento, Calif. Leaves practically identical with those of the Trinidad variety, but fewer are produced from lateral tubers. The buds of corms and tubers are more reddish than those of the Trinidad: corms usually larger and more regularly ovoid or roundish; the 10 to 15 lateral tubers (fig. 8) are larger and more uniform in size and shape than those of the Trinidad. The corms are variable in quality, sometimes very good, but usually too unreliable for market purposes. The tubers are nearly white when cooked, somewhat moist, and without distinct flavor; but they are of pleasing table quality and become even better in storage. Although the number of lateral tubers to the hill is small, their relatively large size and uniform shape commend the Sacramento dasheen for cultivation when it is not definitely expected to market the corms.



FIGURE 9.—A 4½-ounce tuber (natural size) of the Ventura dasheen. In quality the Ventura dasheen is scarcely distinguishable from the Trinidad, but the lateral tubers are fewer and more uniform in size and shape.

to those of the Sacramento. The corms are slightly smaller than those of the Trinidad variety, but more regular in form; the tubers (fig. 9) are about the size of the average Trinidad tubers, but fewer and usually more uniform in size and shape. The quality of corms and tubers is excellent, similar to that of the Trinidad.

#### CULTIVATION

The dasheen is a long-season crop, adapted for culture only in regions where there is normally a very warm, frostless season of at least 7 months. It also needs a rich loamy soil, an abundance of moisture, together with good drainage, and a fairly moist atmosphere. As a commercial crop in the United States, therefore, it is limited to lands that are comparatively low on the Coastal Plain from South Carolina to eastern Texas.

For the best development of the dasheen, both in quantity production and table quality, a very moist but fairly well-drained rich sandy loam is ideal. Soils similar to those of the hammock lands of Florida are especially suited to this crop. Soils lacking in fertility or moisture give reduced yields, while those poorly drained

*Ventura* (P. I. no. 47003).—Obtained in 1916 from a grower at Ventura, Calif., who had obtained it several years previously from a local Chinese gardener. Leaves similar to those of the Trinidad variety, but bases of petioles much more reddish. The buds of both corms and tubers are deep red, similar

produce dasheens of such inferior quality as often to be unsuitable for table use. The crop is not greatly injured, however, by occasional flooding for short periods.

Some types of muck land (such as some of those of the Florida Everglades) when properly drained yield large crops of dasheens of fair to good quality. Unfavorable weather conditions, however, often materially lower the quality of the crop by destroying the mealy cooking character. A long drought in the late summer followed by renewed growth of the dasheens or a prolonged wet period during the fall without adequate drainage may make the crop from these soils practically unmarketable for food purposes. The corms are the more seriously injured in quality, though the lateral tubers are somewhat affected. The size of the crop is also reduced.

Planting should be done as early as climatic conditions permit—2 weeks or more before the last spring frost is expected. Where the frostless season does not exceed 6 months, it is well to start the tubers a month earlier inside and set out the plants when danger from frost is past.

It is best to plant tubers weighing from 2 to 5 ounces each, but good results are obtained with much smaller ones if the soil conditions are favorable. Experiments to determine the effect on the resulting crop from the planting of tubers of good and of poor shapes have shown no advantage in selecting those of superior form. For field culture tubers or small corms are planted whole and singly, not more than 2 or 3 inches deep. The top portions of medium-sized or large corms, if available, give strong plants. Tubers or corms with the terminal buds living are always to be preferred for planting unless it is desired to increase the number of corms raised. If the terminal bud of the tuber or corm grows, one new corm results (fig. 10, A); if the terminal bud fails to grow (fig. 10, B), two or more lateral buds usually start, and each becomes a corm. Each new corm then gives rise to lateral tubers.

It is recommended that dasheens be planted in  $3\frac{1}{2}$ - or 4-foot rows, about 2 feet apart in the row. In earlier practice they usually were spaced so as to allow about 12 square feet to the plant, but later experiments conducted by the Department showed that increased yields could be obtained by planting closer. This practice also results in more complete shading of the ground when the plants become large, thereby tending to reduce the labor of keeping down weeds.

Reasonably deep cultivation of dasheens in the early part of the season is beneficial if soil moisture is sufficient, but from and after midsummer the soil should be gradually drawn to the plants and the ground kept free from weeds by frequent but very shallow cultivation or hoeing. The dasheen is very shallow rooted, and the crop is easily injured if the surface roots are disturbed. When a few plants only are grown and it is desired to get a maximum yield of dasheens, mulching with dry grass or any kind of litter may be practiced in dry weather to conserve the soil moisture.

Planting dasheens early in February has given good results as far north as the northeastern coast section of South Carolina. A satisfactory method is to turn a 4-inch furrow over the tubers from each side when they are planted, leaving a ridge over the row. About April 1, or when the weeds have just sprouted, the ridges are broken

with a harrow. A second and even a third harrowing often can be given before the dasheen plants are large enough to be injured by this method of cultivation.

Under favorable conditions the plants reach a height of 5 to 7 feet in midsummer, and where frost does not occur after April 1 it is often possible to obtain dasheens for home use early in September. The corms and tubers do not begin to develop rapidly until August. The harvesting of the main crop should be deferred until the first frost or until the growth of the tops practically ceases and the older leaves die.

The corms (usually of marketable size if in good soil) constitute from one-third to more than half the yield of a hill of dasheens.

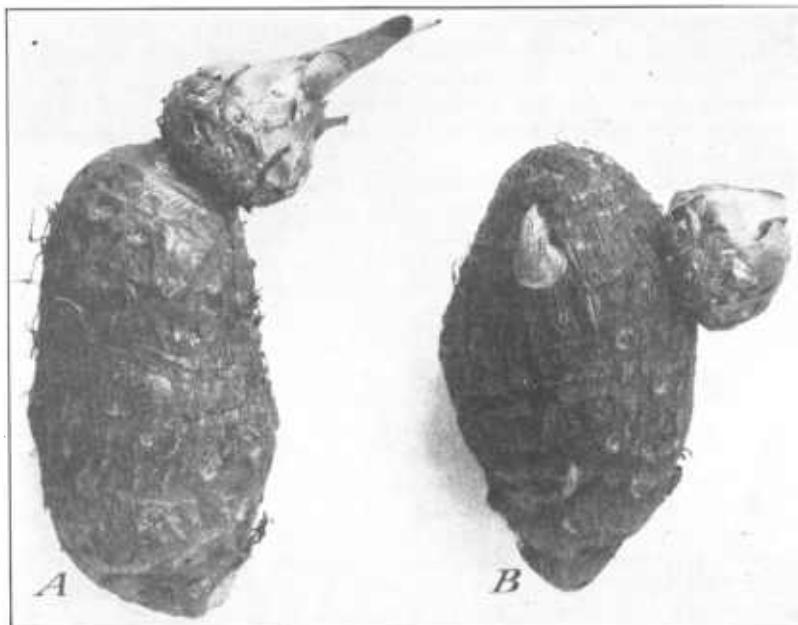


FIGURE 10.—Sprouted dasheen tubers. A corm is developing from the terminal bud of the tuber (A) on the left. The terminal bud of the right-hand tuber (B) was destroyed, and two laterals have sprouted. From one to five, or even more, lateral buds may begin to grow from a corm or large tuber if the terminal bud dies.

and the tubers suitable for market make one-eighth to half the total weight. With a total yield of 250 bushels per acre, the merchantable crop therefore may be from 100 to 150 bushels, depending in part upon the closeness of grading. The remainder, sometimes as much as half the yield, consists of tubers unsuitable for market because of size or shape. As a rule, the larger the yield, the higher the proportion of first-grade tubers. With a low rate of yield there may be almost no tubers of this grade and very few corms large enough for market. This fact emphasizes the importance of securing as heavy a yield as possible on whatever area is grown.

#### FERTILIZERS

An abundance of humus in the soil is essential for successful dasheen culture. For this reason the turning under of a soiling crop—preferably a legume—beforehand or of a liberal quantity of

well-rotted barnyard manure at planting time is advised when practicable. This may be supplemented, especially when a good supply of manure is not available, by the application of a commercial fertilizer of high potash content. In most soils suited to dasheens the use of a complete fertilizer seems to be justified by the increased yields. At the United States Plant Introduction Garden, Brooksville, Fla. (closed in 1925), where the crop was grown on hammock land, a fertilizer approximating the following formula was used with good results: Ammonia, 4 percent; phosphoric acid, 6 percent; potash (as sulphate), 10 percent. About 700 pounds per acre was used in each of two applications, the first soon after planting and the second early in July. Hardwood ashes (unleached) also may be used, at the rate of 1,000 to 1,500 pounds per acre, if there is a shortage of potash from other sources.



FIGURE 11.—Turning over dasheens with a 10-inch plow at Brooksville, Fla. After being turned out the clumps are broken apart, most of the soil shaken from the roots, and the plants usually left on the ground to dry from 1 to 3 days before the tops and roots are removed.

#### HARVESTING

#### DIGGING

It is the best practice to let dasheen plants mature well before harvesting the crop. The corms and tubers appear to increase in weight during the maturing process by assimilating food materials from other parts of the plants; harvesting and cleaning become easier because of the dying of the leaves and roots; and, perhaps even more important, the crop may be expected to keep better in transit or in storage as a result of the more complete maturity.

Harvesting dasheens, for the present at least, is more costly than harvesting potatoes because of the hand labor required in separating, cleaning, and sorting them. A 10-inch plow has proved satisfactory for turning the plants over (fig. 11) when the area grown is large enough to justify its use. If the crop is not heavy an 8-inch plow may be large enough, or a furrow may be turned away from one or both sides of the row to facilitate digging by hand. Small hills are easily lifted with a potato fork; but with larger ones the work is much more quickly done by two men with long-handled, round-



FIGURE 12.—Digging dasheens by hand. Two men lift the clump with long-handled round-pointed shovels, while the third pulls it by the tops and lays it on its side. Two men can do the work, or even one, where the plants are small; but where the plants are as large as those shown three men can work about twice as rapidly as two. Hand digging is to be preferred to plowing if the area is small or if root knot is suspected and it is desired to select tubers from disease-free hills for seed purposes.

pointed shovels. With very large plants, if the tops are still standing and especially if furrows have not been run along the rows, it may be advisable to have a third man grasp the tops and pull the plant over as it is loosened and lifted with the shovels (fig. 12). Some growers cut off the tops within a few inches of the ground before digging the crop, but in so doing they lose the possible benefits that are believed to accrue from allowing the tops to dry while still attached.

Even on rather sandy land and when the plants are well matured, the numerous fibrous roots and the firm attachment of many tubers

to the central corm hold the soil so firmly that a clump of dasheens cannot well be separated except by hand. If the tops are still attached, these may be grasped and the clumps thoroughly shaken to dislodge as much of the soil as possible; they can then be broken apart by means of the tops. The potato fork cannot be used to break the clumps without certainty of injury to many of the best corms and tubers. The smallest injury will permit the entry of rots that are ever present in the soil. In dry weather, if the sun is not too hot, the dasheens with tops attached may be left to dry on the ground from 1 to 3 days. The tops and feeding roots, having then become more or less withered, are much more easily removed than when the plants are first dug.

It is highly desirable to harvest the crop during dry weather, if possible, as it is of the utmost importance that the tubers have time to dry well in the open air before being shipped or stored. They should not be exposed to frost, however. The packing or storing of dasheens without adequate drying or curing is likely to result in considerable loss through storage rots. If the weather or other circumstances make it impracticable to dry the dasheens in the open they should be given very free ventilation under cover for a week or more before being placed in closer quarters.

#### CLEANING AND GRADING

The entire cleaning of dasheens may be done in the field, either on the ground or on a bench (fig. 13); or the tops may be cut or roughly broken off, the soil removed, and the dasheens carried in suitable trays to a shed or other place for further cleaning. The irksomeness of the constant bending over and the consequent waste of energy in cleaning dasheens on the ground have been thought amply to justify the small expenditure required for the construction of a rough bench or table on which to do the work. Growers generally, however, seem not to have come to this conclusion.

Dasheens for market should be well cleaned; that is, the bases of the leafstalks should be removed entirely from corms and tubers that have borne leaves, and the feeding roots and other loose fiber removed from all. This does not mean that every particle of loose fiber is to be removed, but it does mean that all the roots and enough of the other fibrous matter should be taken off to leave the dasheens in attractive condition for market. Reasonably thorough cleaning also lessens the danger of heating or decay, by permitting better circulation of air among the dasheens when they are stored or packed for shipment.

When dasheens are to be stored by the grower the bases of leafstalks may be left attached, if desirable, until the dasheens are to be used or shipped. In such case, however, these remains of the tops must be allowed to dry out thoroughly beforehand, and the dasheens must not be stored in too deep a layer or with poor ventilation.

In the cleaning of dasheens it is usually best to grade them as they are handled. No satisfactory mechanical grader has yet been devised. At present it seems advisable to make only three grades, as follows: (1) Ovoid tubers not smaller than 3 ounces each and medium-sized secondary corms (figs. 4 and 5) of good shape; (2)

corms of all sizes suitable for market, including large secondary corms; (3) all tubers smaller than 3 ounces, all sizes of decidedly ill-shaped tubers or secondary corms, and all very small or stunted corms. Seed dasheens may be selected from the last grade and the remainder of this material used for the home table or for stock feed. The subject of grading for market is treated in detail under Marketing.



FIGURE 13.—Cleaning and grading dasheens at a bench in the field. The dasheens, with the clumps broken apart and the tops cut off, are brought to the bench in field crates.

#### STORAGE

Dasheens can be stored successfully at 50° F. with ventilation. Tubers keep better than corms, and the latter should therefore generally be used or otherwise disposed of as early as practicable. Tubers have been kept for nearly 6 months (from early December to late May), unsprouted (fig. 6) and with but slight loss from decay, in a dry basement where the temperature ranged most of the time between 45° and 55°. Among the tubers were some corms, a few of which were kept in sound condition until nearly the close of the period. These dasheens were shipped in a barrel and were en route for 3 weeks. They were emptied out upon arrival, replaced in the barrel after being aired for an hour, and kept loosely covered for the entire period during which they were being used. The importance of ventilation in reducing loss of dasheens from storage rots can scarcely be overemphasized.

Experiments in storing corms and tubers in barrels and crates in a commercial storage place at a temperature of about 36° F. show that this degree of cold will kill the buds and that the dasheens will decay

while still at this temperature if the period is as long as 6 weeks or 2 months.<sup>6</sup>

Dasheens withstand temperatures near the freezing point for a short time without apparent injury; and the wide fluctuations of temperature during the winter in Florida in any ordinary storehouse or other building do not seem to be especially injurious to them until the heat becomes sufficient to induce sprouting. As has been previously stated, however, a curing period of several days with free ventilation at harvest time is essential for successful storage in quantity.

Another method of storing dasheens where the quantity is not too large has been used successfully by several cooperators in the South. The entire clumps are lifted after frost, with the bases of leafstalks, the roots, and soil still attached, and placed close together under an open shed. They are covered with soil where necessary as a protection against freezing. Both corms and tubers usually keep perfectly under these conditions while the weather remains cool.

The season during which dasheens are usually available on the market in first-class condition without special storage facilities extends from November to about the first of March. By placing in storage under proper conditions the part of the marketable crop for which there is not a demand at reasonable prices at the time of harvest, it is believed that the growers could not only protect themselves in a measure from low prices but considerably increase the length of the season of use. The results of various small-scale experiments give reason to believe that this could be extended to July or later. Obviously, if the demand continued, this extension would result in a larger consumption of dasheens.

#### MARKETING

The market for domestic dasheens is still limited, partly for the reason that only a very small part of the population is familiar with this vegetable and partly because of heavy imports at low prices from the Tropics and the Orient. Just what the future may hold for the industry cannot be predicted with assurance, but it is certain that with a supply of uniformly good quality placed on the market every season, and a better understanding on the part of consumers of methods of preparation for the table, the chances for increased use of dasheens will be improved.

The general question of a market is so vital to the large grower that, if he expects to continue the cultivation of the crop for market, he should give serious attention to the more important phases of the problem. He should know, at least as well as any dealer or consumer, what constitutes good quality, good appearance, and proper packing.

There is a natural tendency for the grower of dasheens to get the crop off his hands with the least possible labor even at a low price and an equally natural desire on the part of the wholesalers to pur-

<sup>6</sup> L. L. Harter, pathologist, of the Division of Fruit and Vegetable Crops and Diseases, stored small quantities of dasheen tubers at constant temperatures of 32°, 41°, 50°, and 59° F., respectively. At the end of 2½ months the buds of all the tubers that had been stored at 32° and 41° were dead and the tubers spoiled, while all those at 50° and 59° were sound.

chase at as low a price as possible. The grower may be reminded, however, that dasheens, perhaps even more than any of the ordinary crops, at present need to be at their best both in quality and appearance in order to sell readily. When a new food is being introduced, as is being attempted with this vegetable among our American people, it is essential that the product should be first-class in every respect. Even among people of foreign birth who already know the dasheen, the marketing of a high-grade product will unquestionably result in larger consumption. The dealer also may be reminded that, while the purchase of dasheens properly grown and prepared for market is strongly advised, the grower must be paid a price that will compensate him for the added cost of production.

A bushel of dasheens after a curing period of a few days weighs about 60 pounds, but the weight for equal bulk gradually diminishes through further loss of moisture to between 50 and 55 pounds. This, of course, puts the late shipper at a disadvantage unless he obtains a higher price per pound.

The prices received by growers for well-cleaned no. 1 dasheen tubers in wholesale quantities have ranged from 4 to 5 cents a pound in the early years of the industry down to 2½ cents or less in later years, and for field-run stock, including all except very small corms and very small or ill-shaped tubers, from 3 cents down to 1½ cents a pound. The lower prices have proved ruinous to growers, but, as has been shown, dasheens and other taros can be and are imported largely at costs as low as or lower than these quotations.

#### TESTING THE CROP FOR QUALITY

The grower of dasheens who expects to market any part of his crop for table use should make cooking tests of a number of corms and tubers from different parts of his field as soon as the crop is sufficiently mature for the purpose. In no case should testing be delayed later than the beginning of harvest. The grower should know that his dasheens are of suitable quality for the table before he makes the first shipment. Either boiled or baked, the corms and tubers when done should be mealy if immediately cut or broken open. Corms recently dug should be cooked by baking, or by parboiling and then baking, in order to avoid having them split open and become watersoaked. (See recipes for baked and plain boiled dasheens, pp. 27 and 28.) Dasheens that are not mealy or that otherwise are not of good quality when boiled or baked should not be marketed for human food. To do so will injure the market not only for the grower who ships the inferior dasheens but for all others.

The commonest cause of poor quality is deficient drainage of the land. Prolonged drought, with the dying back of the tops, followed by renewed growth of the plants, is also likely to result in the loss of the mealy-cooking character in the parts of corms and tubers formed previously. A stiff soil, such as one containing a large proportion of clay, is a third cause of poor quality.

#### GRADING FOR MARKET

Careful attention must be given to the external appearance as well as the quality of corms and tubers for market, if the consumption is to be greatly increased. They should have all roots

and loose fiber removed, and the tubers should be well graded. Very small corms—those from stunted plants—should never be marketed for table use, as such corms are likely to lack the mealy-cooking character which is essential in dasheens for human consumption. The shipping of field-run dasheens retards the development of the market and should be discouraged by both growers and dealers.

Strictly first-grade dasheen tubers (fig. 7) are ovoid, smooth, and weigh from 4 to 8 or more ounces each. In addition to these first-grade tubers, the standard market grade may contain small proportions of (1) tubers of perfect form as small as 3 ounces each and (2) slightly irregular tubers weighing from 4 to 10 ounces each. No very small tubers of any shape and no decidedly ill-shaped tubers of any size should be included in the standard market grade.

There is a difference of opinion as to whether the corms and tubers should be mixed in marketing. The wisdom of mixing them in any given instance will depend largely on whether they are to be consumed within a few weeks or stored for a longer period. The corms do not keep so long as the tubers. Although it is usually better for the growers to keep them separate while in their own hands, there can be no serious objection to mixing them in shipping if the purchaser so desires.

#### PACKING AND SHIPPING

The freight rates on dasheens are the same as on potatoes. Dasheens may be shipped in barrels if these are available at reasonable cost, though burlap sacks holding about 150 pounds may be used with satisfactory results if freezing weather is not encountered. Barrels furnish protection from bruising, however, and in a measure also from freezing if fairly tight. Standard barrels holding from 160 to 180 pounds are to be preferred. When both corms and tubers are packed in the same barrel, as is often required in shipping a single barrel of dasheens, it is usually best to distribute the corms among the tubers rather than to put them all at one end of the barrel.

Burlap covers, if securely held by the top hoop, are satisfactory. Barrels that are nearly airtight should be ventilated (fig. 14) by means of three or four holes one-half to three-fourths of an inch in diameter distributed around the barrel close to the bottom and the same number near the top.

When there is danger that a shipment will encounter temperatures much below freezing for as long as a day or two, the barrels should be lined with one or more thicknesses of paper. Holes should be punched through the paper where it covers the holes bored in the barrel. Paper or straw, or both, may also be placed over the dasheens next to the burlap cover if considered advisable. Barrels of light weight, with spaces between staves, will sometimes need paper lining when heavier and tighter barrels do not.

Containers other than barrels or sacks may be used for dasheens if strong enough; but ordinary boxes, crates, hampers, or baskets are unsafe for freight shipment of so heavy a product except in carlots. The bushel basket (fig. 15), if strongly constructed, makes



FIGURE 14.—A shipment of dasheen corms in standard barrels. Note the holes for ventilation near the tops and bottoms of the barrels. Dasheens may also be shipped satisfactorily in sacks holding not more than 150 pounds when there is no danger of their freezing.

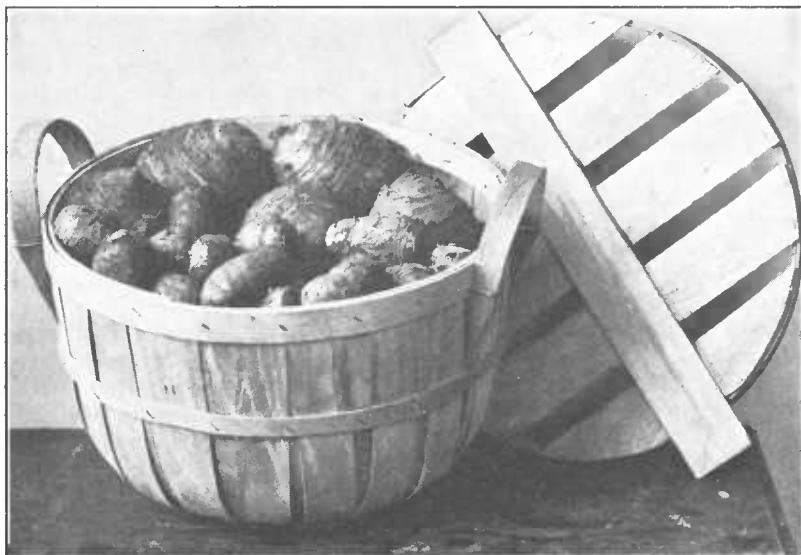


FIGURE 15.—An attractive and convenient container for express shipments of dasheens or for freight shipments in carloads. The bushel basket here shown is packed so that both corms and tubers are in evidence.

a very attractive and convenient package and is especially useful for express shipment of fancy dasheens to small dealers or to consumers. As the market demand increases, some growers of dasheens may find it worth while to clean and grade their product with extra care, to brand the baskets with their own marks, and to ship this type of package to wholesalers. With a standardized product this would simplify the distributing problem for the wholesale merchant and at the same time insure to the careful grower recognition of the excellence of his dasheens.

Freight shipments to northern cities reached by steamship from the South may be routed by steamer from the port nearest the shipper, in order to reduce the time in transit and danger of freezing and also to lower the cost of transportation.

Dasheens shipped in barrels become moist from sweating during transit, especially if the barrels are rather tight or are lined with paper. They should therefore be emptied out to dry for at least a few minutes immediately upon their arrival at destination. Any corms or tubers with soft spots should be removed and the remainder then returned to the barrels. If the dasheens are to be kept for a considerable length of time, the barrels should be only loosely covered.

#### DISEASES AND INSECT ENEMIES

Growing dasheens have but few diseases so far as known. Part of these are caused by fungi; one by a bacterium; and one, known as root knot, is caused by a minute eelworm, or nematode. Thus far only the eelworm disease has become very serious.

##### ROOT KNOT

The common root knot nematode attacks both the feeding roots (fig. 16) and tubers (fig. 17) of the dasheen, causing characteristic knots, or galls, on the roots and wartlike swellings on the tubers. The galls on the roots interfere with the nutrition of the plant and ultimately kill the part of the root beyond the gall. The swellings, or "sores", on the tubers distort and stunt them and when the infestation of nematodes is severe render the tubers unfit for market, as well as making them more subject to decay in storage.

Dasheen plants that are badly affected with root knot often have stunted leaves, especially where the soil is light and infection has taken place early in the season. Generally speaking, the lighter the soil, the more severe are the effects of root knot. The disease can be controlled <sup>7</sup> by selecting seed tubers only from land that is known to be free from root knot infection at the time of harvesting and planting them in land that is free from the nematode. Each grower of dasheens should save his seed tubers from his own plants, provided he can grow them on uninfested land.

Dasheens slightly diseased with root knot may be treated with hot water (122° F.) to kill the nematodes while the tubers are dormant without seriously affecting the vitality of the latter. Any tubers intended for seed that are even suspected of being infested with

<sup>7</sup> Demonstrated by experiments conducted by L. P. Byars, formerly pathologist, Division of Fruit and Vegetable Crops and Diseases.

nematodes should be treated, especially if they are to be planted in land not known to be already infested. The following directions for treatment have been prepared by the Division of Fruit and Vegetable Crops and Diseases:

Immerse the tubers for a period of 40 minutes in water kept at a temperature of 122° F. If the temperature of the water falls below this for more than a few moments the nematodes may not be killed; and if it rises above 126° the tubers may be injured.

A rather large volume of hot water is desirable, and an accurate thermometer should be kept suspended in it so that the temperature can be determined instantly at any time during the treatment. The temperature may be regulated by keeping a low fire under the vessel or by adding hotter water when needed and cold water when the temperature rises above the danger point.

Dasheens should be treated while dormant, since after they begin to sprout they are more easily injured by the hot water. For this reason, when they are

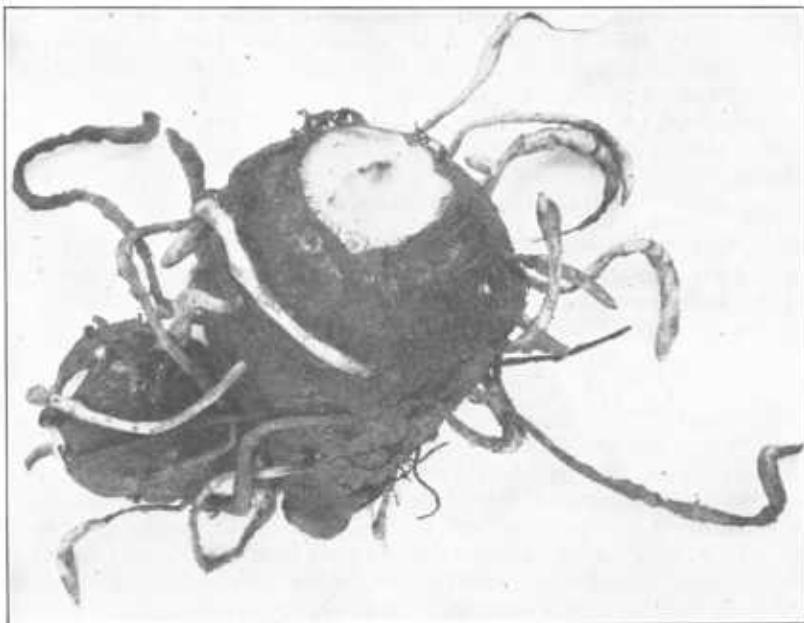


FIGURE 16.—Dasheen tubers (reduced) with the attached feeding roots badly diseased with root knot. The swollen places indicate where one or more nematodes are developing. The tubers in this case, on account of excellent growing conditions and perhaps light original infestation, do not show marked injury.

not planted very early, it is advisable to treat the tubers several weeks in advance of planting.

To avoid danger of introducing the root knot nematode into land not already infested with it, all dasheens to be planted should be treated as above unless they are known to have been carefully examined at the time of digging and the fibrous feeding roots found free from all evidence of this disease. This examination, to be of value, must be made of the fresh roots, for it is only then that the characteristic knots, galls, or swellings are easily and certainly recognized. Examination of the tubers at any other time is useless unless the infestation with nematodes is severe enough to cause distortion. The nematode causing root knot is a minute eelworm. The larvae and males are not usually seen without a lens, but the adult female is as large as a pinprick and may be seen as a glistening white body when a gall is broken open. Its presence is more or less recognized by the swellings on the roots

and tubers. When the disease is severe, most of the fibrous roots of the dasheen are noticeably swollen at one or more places, a condition caused by colonies of nematodes within the roots at those places; and in an advanced stage of the disease many of these roots rot off at one of the swellings, leaving the stubs still attached to the tubers. Some of the lateral tubers from such plants are usually found to be of distorted shape and unhealthy appearance, caused by the nematodes in them; these tubers often decay within a few weeks if stored. Such severely infested tubers should not be used for planting, even if treated.

It is advisable to plant dasheens only on land free from root knot when possible or on land which has been rotated for 1 or more years with root knot resistant crops, such as small grains, velvetbeans, and resistant varieties of cowpeas. For a full discussion of the root knot disease and a list of resistant crops, see Farmers' Bulletin 1345.

#### STORAGE ROTS

When dasheens are stored before they have dried out or cured sufficiently, they are likely to be attacked by one or more of several storage rots. Careful handling of the dasheens, adequate curing in the open air before storing, and proper temperature and ventilation of the storage place are the means of preventing serious loss from these causes.

#### INSECT ENEMIES

The dasheen is attacked by a few insects, but so far only one appears to be menacing in this country. The leaves are eaten to a very slight extent by various grasshoppers and a few hairy caterpillars; aphids, or plant lice, also suck the juice from the leaf blades; and in a few instances a mealybug has been found in considerable numbers on the bases of the petioles. When tubers are kept stored at ordinary temperatures until the weather becomes warm in the spring, the sprouts which develop are likely to be severely infested with aphids. While this is undesirable, it does not seem to injure the tubers for planting, provided the planting is not deferred too long and the insects are not too numerous. It is advisable, however, to rid the sprouts of such infestation before planting, by treatment with hot water (122° F.) or a strong soap solution. One of the red spiders occasionally attacks the older leaves of dasheens, especially during very dry weather.

The one insect pest which threatens to become at all serious is a smooth black or dark-brown boring caterpillar, the larva of a moth.<sup>8</sup>



FIGURE 17.—A small dasheen tuber (natural size) distorted by severe nematode infestation. The numerous swellings on the lower half are caused by colonies of nematodes. Compare this tuber with the smooth healthy ones shown in figure 7.

<sup>8</sup> Identified as *Sphida obliqua* Walk., by the late F. H. Chittenden, Bureau of Entomology and Plant Quarantine.

This borer usually attacks only the corins, though sometimes it bores into one or more of the lateral tubers. In some cases the total length of the burrow in one corm is equal to only once or twice the diameter of the corm, but occasionally a corm is found that has been honeycombed (fig. 18) with burrows made by one or more of these caterpillars.

In emerging from the corm, the borer sometimes works up into the lower part of the petiole of the leaf, but often it leaves the corm at one side. It then forms a cocoon in the ground. A number of these brown cocoons, about three-quarters of an inch in length, will usually be found in the soil in harvesting a crop of dasheens. No thoroughly effective plan of procedure against this pest has yet been suggested, but the destruction of the cocoons or larvae found during harvest will doubtless tend to reduce the number the following season.



FIGURE 18.—Dasheen corm riddled by a boring caterpillar which attacks the growing dasheen and emerges from the corm usually about harvest time.

#### USES

Three different products are obtained from the dasheen plant: (1) The corms and tubers, containing principally starch and protein, are used like potatoes; (2) the young green leaves are cooked as greens (see p. 34 for special directions); and (3) the blanched young shoots, obtained by forcing corms in the dark, furnish a tender vegetable having a flavor somewhat similar to that of mushrooms (fig. 19).

#### CORMS AND TUBERS

##### PREPARATION FOR THE TABLE

Good dasheens, well cooked, are mealy and have a delicate nutty flavor. They are drier and firmer than potatoes, containing about one-half more of nutrient materials. The flesh may remain white when cooked or may become cream colored, grayish, or violet; the corms usually become darker than the tubers. The corms (figs. 2 and 3) commonly weigh from three-fourths of a pound to 3 pounds each, but occasionally they are much larger. Grown under proper conditions, the corms when cooked are somewhat drier, more mealy, and richer in flavor than the lateral tubers (figs. 3 and 6), although not quite so fine in texture or so white. For many dasheen dishes, corms and tubers are equally well suited, while for a few dishes one type or the other is preferable. In the recipes which follow it is assumed that dasheens of good quality are available; but, as with other vegetables, it is to be expected that at the best occasionally a poor specimen will be found.

As with any new food product, it is important when one is eating dasheens for the first time to have them prepared and served just

right. For persons who have become familiar with the vegetable no greater care is required than in preparing potatoes. Being a somewhat drier and more concentrated food than potatoes, dasheens will absorb a larger proportion of butter; but if eaten more slowly, as they should be, an excessive quantity of butter is not required. Baking is one of the best methods to use for a first trial of dasheens, provided they can be served and eaten promptly; in this way the flavor and other qualities are likely to be more natural.

Dasheens require a little less time for cooking than potatoes of equal size; this is especially important to remember in baking. For ordinary baking or boiling they should be cleaned dry with a stiff brush or coarse cloth and then rinsed in water. The scraping of dasheens is not advised when brushing will serve. If it is desired

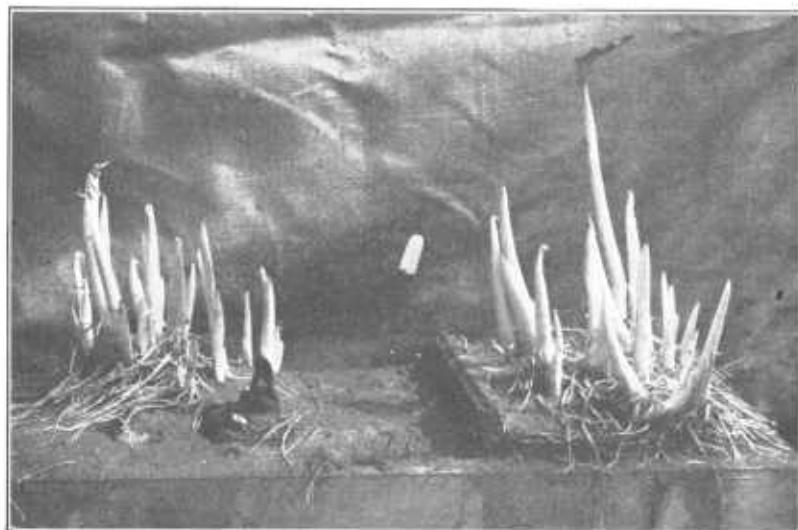


FIGURE 19.—Dasheen shoots forced in wet sand in a box, with bottom heat, and blanched by being enclosed in a burlap-covered frame. Several cuttings can be made at 10-day intervals.

to scrape them, handle them dry, in order to avoid possible temporary irritation to the hands. In washing the hands after scraping, it is well to add a teaspoonful of washing soda (sodium carbonate) to the quart of water. Soda is seldom necessary in washing the hands after ordinary paring if the dasheens are handled dry.

#### RECIPES<sup>9</sup>

**Baked dasheens.**—The cleaned corms or tubers may be put directly into a moderate oven—about the same as for potatoes; or they may first be parboiled 5 to 10 minutes (depending upon size). To facilitate baking, very large dasheens (corms) may be cut in half—always lengthwise. Do not overbake. Parboiling hastens cooking and lessens the possibility of waste from the formation of a hard crust in baking. Test with a fork or by pressure with the

<sup>9</sup> The original dasheen recipes which furnished a basis for the subsequent studies resulting in those published here were formulated in 1909-10 in the Department of Home Economics of the University of Tennessee, by Louise G. Turner, assistant, through the courtesy of Catharine A. Mulligan, then dean of women. Studies of methods of preparation of dasheens have been conducted also by the Bureau of Home Economics.

fingers. When done, the dasheens should be served promptly in a warmed dish covered with a napkin, and eaten without delay. Season with salt and butter. If the dasheens are well cleaned beforehand and are not overbaked, the light crust formed will be found especially palatable.

A hot oven may be used in baking dasheens, but in such cases it is necessary to prick the skin after the tubers have been in the oven about 10 minutes, in order to prevent their bursting. With a hot oven the time of baking should, of course, be shortened.

Baked corms, a pound or more in weight, may be served in the "half shell" with a piece of butter placed in the center of the cut surface. Another method is to remove the baked skin from each half corm, place the half on its flat surface, and slice it down, lengthwise, in half-inch slices (fig. 20); serve very promptly, in a warm dish, preferably covered.

Pared or scraped dasheens (handled dry, as previously directed) may be cooked in one of three ways: (1) Roasted with meat, (2) rubbed with fat and baked, (3) immersed in nearly boiling water long enough to heat through and baked. With the last two methods a particularly delicious soft crust is formed, provided the dasheens have not been baked either too quickly or too long.

Plain boiled dasheens.—Place the whole dasheens, unpared, in hot water (salted or fresh) and boil until done—not longer than for potatoes of equal size. Pour off water immediately upon removal from the fire, and if practicable place the dasheens in the oven for a few minutes to dry off. Serve hot, in a warmed dish covered with a napkin, and eat at once with salt and butter or gravy. If desired and it does not involve delay, boiled dasheens may be peeled before being placed on the table (fig. 21). Large corms are conveniently served peeled, cut lengthwise into halves, and the latter sliced as suggested for baked corms and as shown in figure 20. It is usually better during the autumn and early winter to parboil dasheen corms for only 10 minutes and then bake, as the corms split open and become water-soaked if cooked entirely by boiling at any time within a month after they are dug. This applies to the corms only, not to the tubers.

Boiled and buttered.—Small tubers are especially good if, immediately after being boiled and peeled, they are placed in the oven just long enough to melt a dressing of butter over them. When so prepared, if kept in a warm place, they are less likely to become soggy from standing.

Fried dasheens.—(1) Boiled dasheens, either warm or cold, may be peeled, cut into thick, even slices, salted, and fried (sautéed) quickly, one layer deep, in a covered frying pan. Fry only until very slightly browned on each side; remove from the fire at once and serve. If the dasheens are very dry, add 1 or 2 tablespoonfuls of water before frying and keep the pan closely covered.

(2) Small tubers are very good boiled, peeled hot, and fried lightly either whole or in halves. The frying should be done immediately following the boiling.

(3) Pare raw tubers and cut lengthwise into eighths; soak in water for a few minutes, drain, sprinkle with salt, and dredge liberally with flour; fry slowly to a straw color, with a moderate quantity of fat (not deep fat) in a closely covered frying pan, stirring the slices occasionally. This method gives a most delicious dish and one that is quickly prepared.

French-fried dasheens.—French-fried dasheens are exceedingly good if not fried so long as to make them too dry; they require less time than potatoes.

Fried dasheen cakes.—These cakes are made like the taro cakes of Hawaii. They are very delicious and are especially recommended for use when it is desired to serve dasheens on short notice. Boil the dasheens in their skins, peel, and "rice" or mash while warm. Season with salt and a little butter (add no milk). With the hands moistened, mold into small cakes to be fried when required.

Dasheen cheese cakes and fish cakes.—Boiled dasheens riced or mashed while hot may be combined with cheese or with canned or shredded fish or left-over fish, made into cakes or croquettes, and fried.

Riced dasheen.—Boil (or parboil and bake) the dasheens in their skins. Remove the skin immediately, rice the dasheen into a heated dish, and proceed in one of the following ways:

(1) Stir in the desired seasoning, such as butter and salt, and serve in a warm, covered dish. Butter may be omitted if gravy is to be used. Milk or cream may be beaten in if desired, but prepared in this way the dasheens will not be so light.

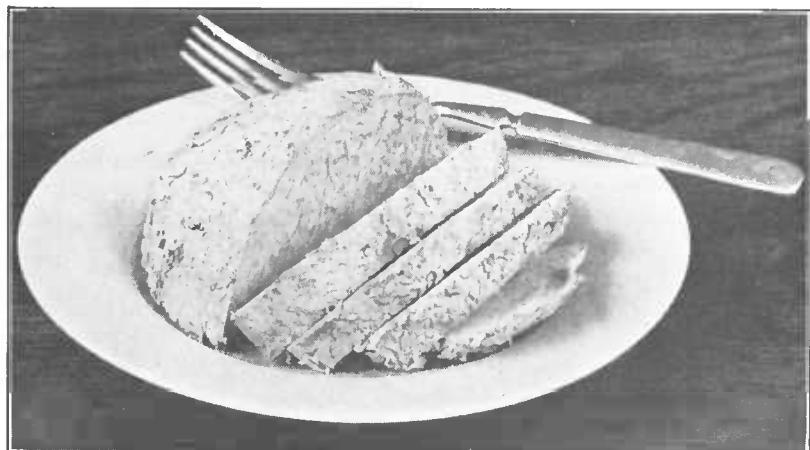


FIGURE 20.—Half of a baked dasheen corm peeled, sliced, and ready to serve. Boiled corms may be served in the same manner. A warmed plate or dish (preferably covered) should be used and the dasheen served very promptly after being peeled. Lengthwise slicing of the corm is best. The advantage of having the fibrous skin removed before serving the corm is obvious.

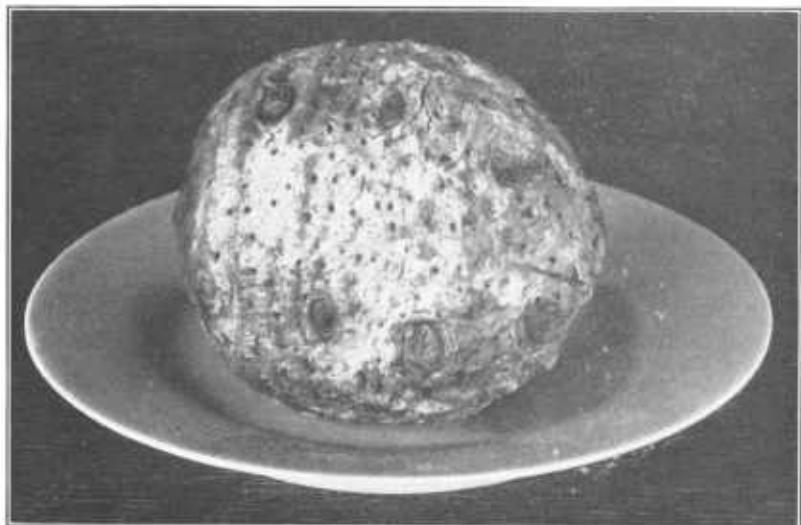


FIGURE 21.—Dasheen corm boiled and peeled, showing the root scars and buds on the surface after the removal of the thin fibrous skin. As is evident from the illustration, dasheens may be prepared for the table without waste. With suitable seasoning (the same as used for potatoes) the corm as shown is ready to eat.

(2) Empty the riced dasheen in layers into a warmed serving dish (fig. 22), seasoning each layer. Do not stir.

(3) Season the riced dasheen as desired and put into a baking dish with a liberal quantity of butter on top. Bake for 8 to 10 minutes and serve.

In ricing dasheens the round, or plunger, type of ricer rather than the triangular lever type should be used. One with steel handles is better than one with cast-iron handles, which are too easily broken, especially in ricing corms.

**Filling for fowl and other meats.**—In preparing dasheen filling, about two-thirds of the usual quantity of bread is replaced with dasheens (boiled in their skins), riced or well mashed. Season as desired. Dasheen filling is mealy and compares favorably with chestnut filling.

**Dasheen hash.**—Prepare from cold boiled or baked dasheens, with meat and seasoning as for ordinary hash.

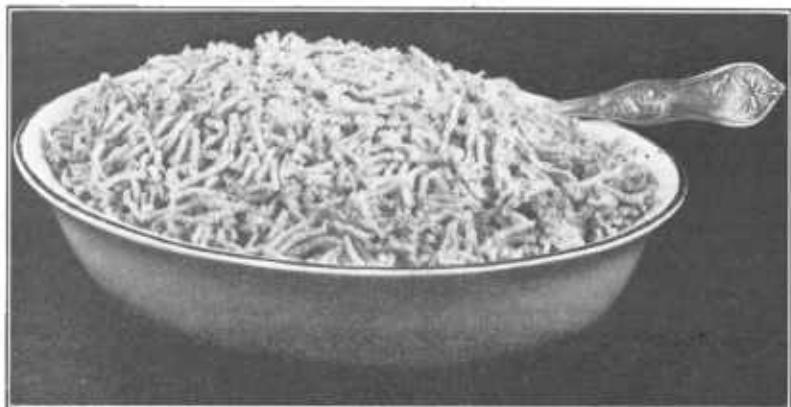


FIGURE 22.—Riced dasheen ready to serve. The dasheens—corms or tubers—are boiled in their skins and peeled and riced while hot. This is an excellent way to serve boiled dasheens.

**Dasheen flakes or granulated dasheen.**—This recipe should become familiar to everyone who uses dasheens, because it furnishes a means not only of utilizing cold dasheens but also of preparing a most excellent dish on very short notice. Use dasheens boiled or baked one or more days previously. Corms are especially well suited because of their mealiness, but tubers also may be used. Peel the dasheens and grind them with a food chopper with nut-butter grinder or other fine adjustment into a chafing dish or covered vessel which can be placed in the oven. If the dasheens are very dry, a spoonful of water put in the dish before grinding will help to prevent scorching. Salt the dasheens while grinding and, without stirring or adding anything else, heat and serve promptly. Do not permit the dish to steam uncovered. Eat with butter or gravy. The recipe may be varied by grinding cheese with the dasheens or by sprinkling the top with grated cheese and browning slightly at the last.

**Scalloped dasheens.**—Pare and slice raw dasheens, putting the slices in layers into a buttered baking dish, and seasoning each layer with butter, salt, etc. The addition of a few thin slices of onion brings out the dasheen flavor. Latticework slices of dasheen (fig. 23), made with a fluted slicer, are a little more attractive in appearance than the plain ones, and they do not mat together. Nearly cover with rich milk, and bake. Scalloped dasheens require only about two-thirds as much time in cooking as scalloped potatoes. When corms are used for scalloping, it is well to discard about three-quarters of an inch of the upper, or bud end, as it may be tough after cooking. On account of the firm texture of the dasheen, a slicer with the sliding guard made of wood rather than of tin is desirable if a fluted slicer is used.

This method of serving the dasheen will be found particularly well suited for banquets or formal dinners, and in such cases individual baking dishes or casseroles should be used if practicable.

**Dasheens scalloped with cheese.**—Proceed as for scalloped dasheens, but use less butter and add grated cheese. Add bread crumbs to the top layer.

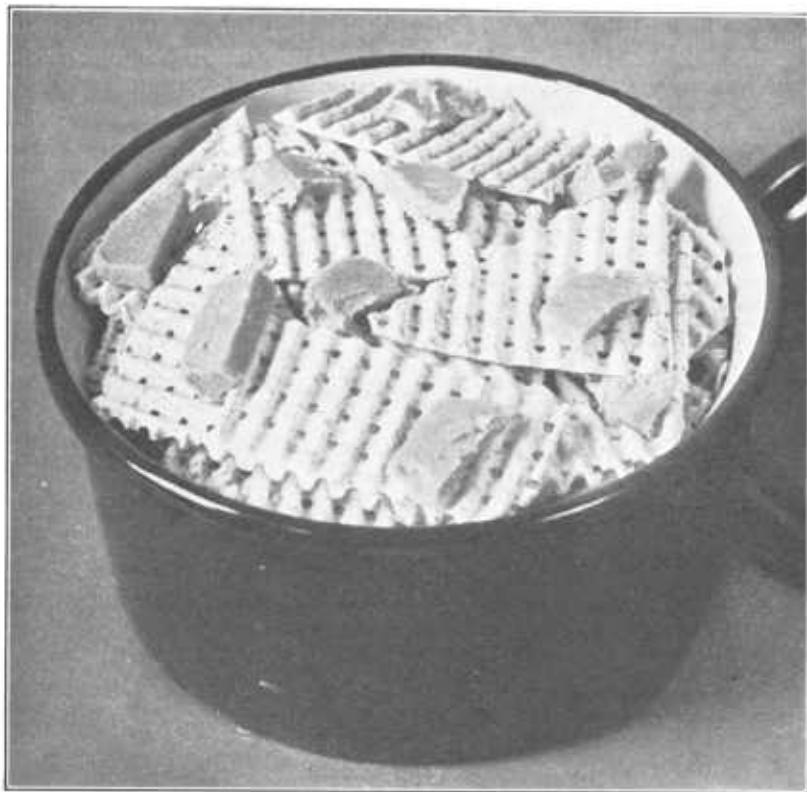


FIGURE 23.—A casserole of sliced dasheens dotted with butter, ready for other seasoning and the addition of milk for scalloping. Latticework slices are made with a fluted slicer, but plain slices may be used. Dasheens also may be scalloped with grated cheese and bread crumbs.



FIGURE 24.—Dasheen chips, Saratoga style. Dasheen chips are made in the same way as potato chips. They do not absorb as much fat as potato chips and have a distinctive nutty flavor. Tubers are more suitable than corms for making chips.

**Dasheen chips, Saratoga style.**—Dasheen chips (fig. 24) are made in the same way as potato chips. Tubers are much better than corms for making chips. Pare raw dasheens without wetting them. Slice evenly about one-sixteenth of an inch thick and soak in plenty of water for 1 to 2 hours, changing the water at least once. Dry the slices between cloths and fry in deep fat to a straw color. Place the chips on paper so that the excess fat may be drawn from them. Salt immediately when taken from the hot fat. The chips will keep for some time without becoming rancid if fried in a good vegetable fat or oil.

**Dasheen crisps.**—Dasheen crisps (fig. 25) are especially recommended. Large tubers are usually best for this purpose, but corms of mealy cooking quality are entirely satisfactory. The crisps are made by cutting pared raw dasheens into latticework slices, as for scalloped dasheens, soaking for an hour or more in at least two changes of water, and frying slowly to a straw color in deep fat. Drain on paper and salt immediately. The use of vegetable fats or oils is advised.

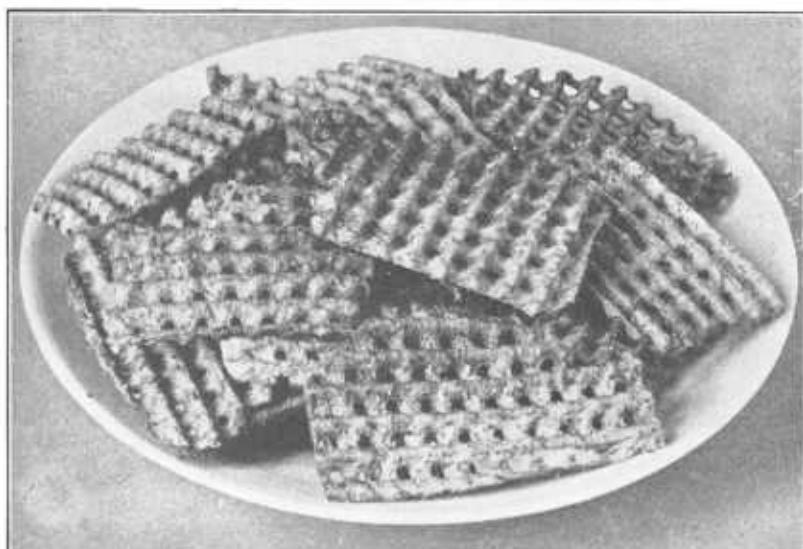


FIGURE 25.—Dasheen crisps. An especially attractive and delicious product made by slicing raw dasheens with a fluted vegetable slicer and frying in deep fat.

Except in a very moist atmosphere, dasheen crisps and chips retain their crispness for several days without reheating.

**Dasheen salad.**—One of the best ways of serving dasheens is as a salad, especially if the dasheens are to be prepared some time in advance or if the number of persons to be served is large. Dasheen salad is prepared like potato salad except that with dasheens the tubers (boiled in the skin) are partially chilled in cold water as soon as done, in order to prevent their becoming too dry and mealy; the salad is then prepared immediately. Tubers, being a little moister than corms, are usually preferred for salad.

**Stuffed dasheens.**—Proceed as in baking. When the dasheens are done, follow the method used for stuffed potatoes, except that more butter is used. If moistened with cream instead of milk, still better results follow. Grated cheese also may be mixed with the dasheen or sprinkled on top, as in the case of the half corms shown in figure 26.

Corms are especially adapted for serving in this manner; they may be scraped or simply scrubbed, as preferred, and unless much smaller than a pound in weight they may be cut in half—always from the top to the base. Instead of mashing dasheens it will be found better to put them through a potato ricer. After baking, any part of the corm found to be hard should be discarded.

**Dasheen corms stuffed with meat.**—Corms 3 or more inches in diameter are used for this purpose. Clean the corm thoroughly, by scraping or with a stiff brush. Cut the base off squarely so that the corm will stand upright. With the aid of a paring knife and an apple corer cut a cylindrical hole, at least  $1\frac{1}{2}$  inches in diameter, from the top to within three-quarters of an inch of the bottom; save the top of this core to plug the top of the cavity. Hollow out the interior of the corm to make additional space for the filling, leaving the walls at least one-half inch thick. Parboil for 10 minutes in water that is well salted. Fill with cooked chopped meat, well seasoned and with plenty of fat, and replace the plug. Bake in a moderately slow oven until done. Do not overbake. Serve immediately, cutting the corm downward into halves, quarters, or smaller portions.

**Dasheen pancakes.**—Excellent pancakes are made by using one part of grated raw dasheen to one, two, or three parts of wheat flour, with the other ingredients as usual.



FIGURE 26.—Stuffed half of a dasheen corm. Corms a pound or more in weight are best for use in this way. The corm is first baked and the contents removed and seasoned. This is one of the most attractive of the many dasheen dishes.

**Dasheen fritters.**—

|   |                                    |
|---|------------------------------------|
| 1 cup of grated or finely ground raw dasheen. | $\frac{1}{2}$ teaspoonful of salt. |
| 1 cup of white flour.                         | 2 teaspoonfuls of baking powder.   |
| 1 tablespoonful of sugar.                     | $\frac{1}{2}$ cup of milk.         |

Mix the dasheen and the dry ingredients and add the milk. Drop heaping teaspoonfuls into deep hot fat and fry to a golden brown. Sprinkle with powdered sugar and serve immediately, or serve with maple or sugar sirup. These fritters make one of the most delicious of all dasheen dishes.

**Creamed dasheens.**—Tubers are usually better than corms for creamed dasheens, because they are slightly moister and are more often without violet coloration. Mealy cooking corms are satisfactory, however, if they do not darken much when cooked. Boil the dasheens in their skins, peel, dice, season with salt, and nearly cover with milk. Heat slowly and simmer until the milk is mostly absorbed. A sauce made with flour is not used, since sufficient starch to thicken the milk is drawn from the dasheens in the slow cooking. Cold boiled tubers also may be used in preparing creamed dasheens, but they require even slower cooking. This recipe is recommended for use only after dasheens have been tried in other ways.

**Dasheen soup.**—

|                          |                                     |
|--------------------------|-------------------------------------|
| 3 cups of boiling water. | 3 tablespoonfuls of butter.         |
| 3 cups of milk.          | Salt and celery salt to taste.      |
| 3 cups of rice dasheen.  | Parsley or grated onion if desired. |

Boil and rice the dasheens as described. Into a double boiler put the boiling water and add the milk and dasheen. Bring to a boil and cook for 5 to 10 minutes. Season and serve.

**Candied dasheens.**—Peel parboiled dasheens and cut into thick slices or strips. Prepare a sirup made in the following proportions:

|                      |                                  |
|----------------------|----------------------------------|
| 1 cup of sugar.      | 2 to 3 tablespoonfuls of butter. |
| 2 cups of hot water. | Salt to taste.                   |

Either granulated or brown sugar may be used. Cinnamon may be added if desired. Boil the dasheen slices or strips in this sirup in a covered dish until soft, and brown in the oven.

This dish is very similar to the candied sweetpotatoes so commonly served as one of the vegetables to accompany roast meats and fowl.

**Dasheen bread.**—Make the bread in the usual way; but replace one-fourth or one-third, by measure, of the wheat flour with boiled and riced or mashed dasheens. The dasheens should always be boiled in the skin. The bread, which is much like that made with potato in a similar way, is usually a little darker than when made from all wheat; but the texture and flavor are excellent, and the bread does not dry out so quickly.

**Dasheen pie.**—Any recipe for sweetpotato pie will probably do, but the following is suggested as being economical and otherwise satisfactory. The dasheens should be boiled and riced as usual.

|  |   |
|--|---|
| 2 cups of riced dasheen.               | 1 egg (white and yolk beaten separately). |
| $\frac{1}{4}$ cup of butter.           | 2 cups of milk.                           |
| $\frac{3}{4}$ cup of white sugar.      | $\frac{1}{2}$ lemon, juice and rind.      |
| $\frac{1}{2}$ teaspoonful of cinnamon. |   |
| $\frac{1}{2}$ teaspoonful of nutmeg.   |   |

Bake in a deep pie tin. Serve warm.

**Dasheen pudding.**—Proceed the same as with the above recipe for pie. Bake without crust in a deep dish well buttered.

#### LEAVES AND LEAFSTALKS

Dasheen leaves and leafstalks are useful as vegetables, cooked in the same way as other greens except that parboiling with baking soda is required to destroy their acridity unless cooked with fat meat (see recipe). They have much the same food value as other greens. Dasheen leaves may be made a very valuable green vegetable in the South, especially for late summer and fall use. Indeed, the plant will furnish greens for the home table in regions where the season is too short to raise a crop of corms and tubers. Where the tuber crop can be grown the cutting of the leaves will naturally tend to reduce the crop, but if only one leaf at a time is removed from a plant and not too many during the season the loss in the size of the tuber crop will not equal the value of the leaves as greens. If the dasheen crop is harvested before frost, an abundance of unopened leaves is obtained at that time without detriment to the crop. Leaves not yet unrolled or only partly unrolled (fig. 27) are more tender than the open ones, but while the plants are growing rapidly even the fully expanded leaves are quite satisfactory. Because of their acridity, dasheen leaves should never be eaten raw.

**Dasheen greens.**—Remove half or more of the midrib of fully opened leaves and use the unopened ones entire. Cut into pieces and boil for 12 or 15 minutes in water to which a large pinch of baking soda has been added. Drain off the soda water, wash with clear boiling water, and then boil in water seasoned with salt for 20 to 30 minutes or until tender and the acridity is destroyed. Butter and other seasoning may be added as desired.

Boiling in soda water to help destroy the acridity has usually been found unnecessary when the greens are cooked with fat meat.

The petioles, or leafstalks, are also cooked and eaten. The skin of older stalks is removed, but this is not usually necessary with very young ones. They are cut into short pieces and cooked in the same way as the leaf blade; they may be cooked with the leaves or separately. The stalks cooked with lemon juice have suggested to some persons the taste of rhubarb.

#### DASHEEN SHOOTS

Blanched dasheen shoots can be prepared for the table in much the same way as the leafstalks of Swiss chard. They are obtained by forcing the corms in the dark during the winter or early spring. In the North this may be done either on a bench with bottom heat or under a bench without bottom heat. A space above the corms must be tightly enclosed to exclude light. In the far South, the corms may be planted close together in rows in sandy soil and the shoots blanched by keeping the soil ridged above them as they grow. As much as a month may elapse after planting the corms before the first cutting of shoots can be made, but from four to six additional cuttings may be made at intervals of about 10 days.

**Dasheen shoots on toast.**—Cut the shoots into 2-inch lengths, pour on an abundance of boiling water, add salt, and boil for 12 minutes; drain, pour on enough cold<sup>10</sup> milk so that the shoots will be completely covered while boiling, season with salt, and boil for 5 minutes; drain, season with butter, and serve on toast or plain. Cream sauce may be used in serving, if desired.

**Dasheen shoots with bacon.**—Instead of boiling in milk after draining off the first water, add a small piece of bacon or other fat meat<sup>11</sup> and then cover the shoots with cold water, season with salt, and boil for 5 minutes. Drain and serve.



FIGURE 27.—Young dasheen leaf at a proper stage for use as a green vegetable. Such leaves make excellent greens for summer and autumn use. They are very acrid when raw, however, and require special cooking to destroy this property.

<sup>10</sup> The purpose in using cold milk or water after the first boiling is to prevent the shoots from becoming too soft.

<sup>11</sup> The fat of the milk or meat seems to assist in destroying the acridity.

## STOCK FEED

The exact value of dasheens as a stock feed is somewhat uncertain. There is scientific evidence that the starch of raw dasheens is digested with difficulty, especially when the dasheens constitute a large proportion of the total intake of food of the animal. At the Florida Agricultural Experiment Station it was found (1916) that raw dasheens, even in combination with corn, were definitely unsatisfactory for the fattening of pigs. When the ration was 1 part of shelled corn to 4 parts of raw dasheen by weight, the pigs did little more than maintain their weight during the 2 months of the experiment. With equal parts of corn and dasheen the gain was four times as great, but still too low.

That the general deficiency in the dasheen shown in the feeding tests at the Florida Agricultural Experiment Station may have been due to two different food factors in the dasheen is suggested by the report of experiments with white rats made later (1919) at the University of Wisconsin. In those experiments the investigators set out to obtain information concerning the content of the fat-soluble and water-soluble vitamins (A and B). They found that while there was a fairly satisfactory amount of vitamin B (antineuritic) there was practically no vitamin A. They demonstrated, however, that the raw dasheen starch was digested by rats with difficulty, especially when the proportion of dasheen to the total quantity of food was raised much above one-half, on a dry-weight basis. When cooked dasheens were substituted for raw, the digestive disturbances due to the raw starch did not develop, but all the symptoms indicating a very low content of vitamin A continued unless this vitamin was supplied from another source. Incidentally, the results obtained in similar experiments with potatoes were substantially the same as those obtained with dasheens.

A somewhat more recent (1925-26) study, reported in the Bernice P. Bishop Museum Bulletin 37, Food Value of Poi, Taro, and Limu,<sup>12</sup> of the vitamin content of the Hawaiian taro (of the same species as the dasheen) at the University of Hawaii, in cooperation with the Bernice P. Bishop Museum at Honolulu, indicates the presence of a fair amount of vitamin A, as well as of vitamin B, in steamed taro. While the report of these experiments shows definitely that steamed taro contains at least a small amount of vitamin A, the tests were not planned to determine the digestibility of the raw taro or of the dasheen itself in any form. The results, except as they relate to the presence of vitamin A, are in agreement with findings of the earlier experiments to which reference has been made.

The evidence presented seems fairly conclusive with reference to the deficiency of the dasheen as a chief item of feed for stock, especially when fed raw and unless some other feed which the stock obtain contains an adequate amount of the fat-soluble vitamin A. Not only is this latter provision particularly necessary for young and growing animals, but it is important in all animal feeding.

<sup>12</sup> In the summary of the bulletin it is stated that steamed taro is a good source of vitamins A and B, but the data given seem to justify only a rating of fair for vitamin A and fair to good for vitamin B. The taro is stated to rank with cabbage, baked beans, and grapes as a source of vitamin A and to have twice as much as baked white potato. The vitamin B content of taro was found to be about one-half that of whole grains and twice that of milk.

Notwithstanding the adverse evidence on the digestibility of raw dasheens, especially for nonruminants, it is interesting to note that many farmers who have raised dasheens and fed them in considerable quantities to cattle, pigs, and chickens usually in addition to forage and sometimes other feed, have stated that very favorable results were obtained. The adding of dasheens to the feed of milk cows was reported to have been followed by increased milk production and feeding dasheens to laying hens to result in greater egg production. For the hens the dasheens were usually cooked, though sometimes they were fed raw, either ground or finely cut. Until further careful studies have been made in feeding raw dasheens to stock, it is obviously unwise to attempt to draw final conclusions as to their value for this purpose, but at least it seems that under farm conditions it may be profitable to feed to stock cull dasheens or those for which there is not a market at a paying price. Green forage is always an excellent source of the fat-soluble vitamin in which the dasheen is wanting.

It may prove profitable for stock owners who have dasheens to feed to partly cook them when they are to constitute a considerable part of the ration, particularly if the animals do not have access to liberal quantities of forage or other good feeds. Being too low in protein and fat for a balanced ration alone, especially for young animals, dasheens should be fed in conjunction with some grain in addition to a protein supplement, such as fish meal or tankage.

#### INDUSTRIAL USES

**Flour.**—Dasheens, especially the corms, may be converted into flour which is excellent for use in a variety of ways, such as in soups and gruels and also with wheat or rye flour in pancakes, crullers, biscuits, and bread. About one-fourth the original weight of the dasheens is obtained in flour. Considerable interest has arisen at various times over the possibility of developing an industry in the production of dasheen flour, but most of the attempts that have been made to this end have been at too great a distance from the source of supply to give real opportunity for commercial success. On account of the high water content of the dasheen as compared with that of the cereals, it would be essential to establish such a business close to a center of dasheen production. No attempts, so far as known, are at present under way to manufacture the flour.

**Starch.**—Because of the extreme smallness of the starch grain of the dasheen and of the mucilaginous character of the juice, the separation of the starch is rather difficult, and no satisfactory commercial method for accomplishing it has yet been worked out. However, as a result of tests made a number of years ago by a commercial specialist with small quantities of starch separated experimentally, it was stated that it would have undoubted value as a sizing for textiles. The results obtained were stated to be different from those obtained with either potato or cassava starch. More recently the Bureau of Home Economics of the United States Department of Agriculture has shown by scientific tests not only that dasheen-starch paste is suitable for sizing and finishing but also how it acts in comparison with the pastes of starches from potato, canna, corn,

wheat, and rice. The following statement, quoted from Technical Bulletin No. 284, Some Physical Properties of Starch Pastes Which Affect Their Stiffening Power on Fabrics, is of interest in this connection:

Fabrics seem to be stiffened both by starches having penetrating powers and by those having coating powers. Dasheen, which penetrates most thoroughly and coats the least of the starches studied, and canna, which has little penetrating power but coats very well, have stiffness values very nearly the same. In the case of dasheen the stiffness is due to the penetration of the starch, and in the case of canna to the coating power.

These facts are undoubtedly of importance both in the finishing of cotton fabrics in the mill and in the refinishing of them in the laundry. The selection of a starch to be used depends to a large extent on the information available as to the degree of its coating and its penetrating powers. Whether or not a starch which penetrates well or one which has high coating power is chosen depends on the type and construction of the fabric to be sized.

**Industrial alcohol.**—The question of the production of industrial alcohol from dasheens for which there is no other market has often been raised, and recently some experiments have been made by a new process to determine whether or not this is feasible. The conclusion was that so long as waste molasses from sugar mills is available, alcohol from dasheens could by no means compete with that from the sugar-mill product.

**Chips.**—Under Recipes mention has been made of dasheen chips, prepared in the same manner as Saratoga potato chips. Attempts to manufacture dasheen chips commercially have been only partially successful, but it seems probable that at least a small industry in the production of these chips will develop eventually. Only the tubers, and those of the best quality and of rather large size, can be used satisfactorily for this purpose, however. Attempts to use corms or low-grade tubers have resulted in an inferior product.